

Software and MIP Status

Update 1

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AHCAL Testbeam Analysis Workshop
Hamburg, 15. December, 2018

HELMHOLTZ RESEARCH FOR
GRAND CHALLENGES



UNIVERSITÄT
HEIDELBERG
ZUKUNFT
SEIT 1386



CaliceSoft

Latest implemented feature to treat HG/LG pedestals individually

- Feature was implemented to treat HG and LG Pedestals and their corresponding offsets in individual DB collections!
 - ➔ Treat HG/LG hits individually in terms of pedestal subtraction!

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```
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  <parameter name="DBInit" type="string" value="flccaldb02.desy.de:calice:caliceon:Delice.1:3306"/>
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    Ahc2ModuleConnection      /cd_calice_Ahc2/TestbeamMay2018/ModuleConnection      ahc2_ModuleConnection_180822
    Ahc2ModuleLocationReference /cd_calice_Ahc2/TestbeamMay2018/ModuleLocationReference ahc2_ModuleLocationReference_180822
    Ahc2HardwareConnection     /cd_calice_Ahc2/TestbeamMay2018/Ahc2HardwareConnection ahc2_HardwareConnection_180822
    Ahc2DetectorTransformation /cd_calice_Ahc2/TestbeamMay2018/DetectorTransformation HEAD
    E4DPedestal                /cd_calice_Ahc2/TestbeamMay2018/Pedestal                ahc2_pedestal_180906
    E4DPedestalMemoryCellOffset /cd_calice_Ahc2/TestbeamMay2018/PedestalMemoryCellOffset ahc2_pedestalmemorycelloffset_180906
    E4DLowGainPedestal         /cd_calice_Ahc2/Test/LowGainPedestal                     ahc2_lg_pedestal_hg_181130
    E4DLowGainPedestalMemoryCellOffset /cd_calice_Ahc2/Test/LowGainPedestalMemoryCellOffset ahc2_lg_pedestalmemorycelloffset_fake_1
    E4DGainConstants           /cd_calice_Ahc2/TestbeamMay2018/gain_constants          ahc2_gainconstant_180827
    E4DGainSlopes              /cd_calice_Ahc2/TestbeamMay2018/gain_slopes             HEAD
    E4DMipConstants            /cd_calice_Ahc2/TestbeamMay2018/mip_constants           ahc2_mip_constants_180925
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    E4DDeadCellMap             /cd_calice_Ahc2/TestbeamMay2018/DeadCellMap             HEAD
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    E4DPhysicsCalibIntercalibration /cd_calice_Ahc2/TestbeamMay2018/PhysicsCalibIntercalibration HEAD
    E4DTimeSlopes              /cd_calice_Ahc2/TestbeamMay2018/TimeSlopes             HEAD
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    E4DTimeOffsetMem_Even      /cd_calice_Ahc2/TestbeamMay2018/TimeOffsetMem_Even      ahc2_005
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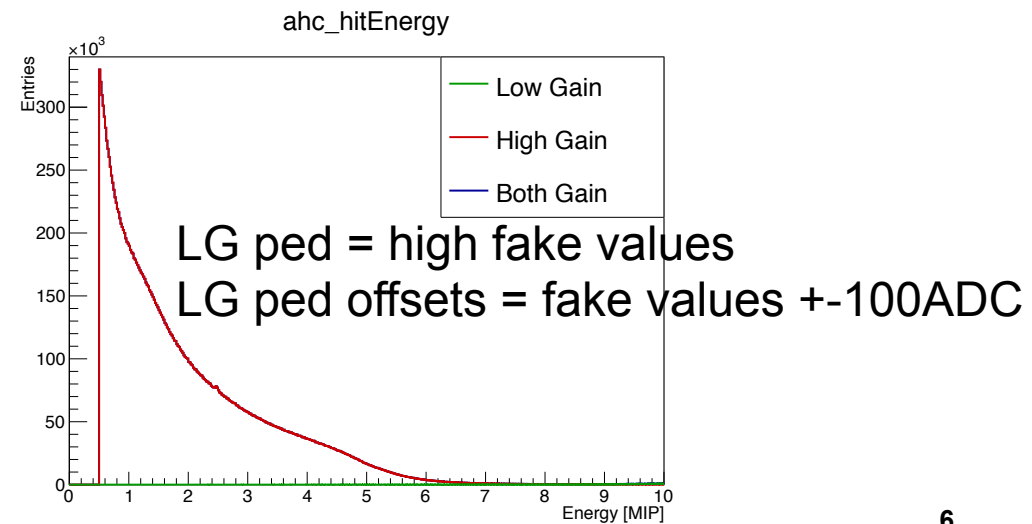
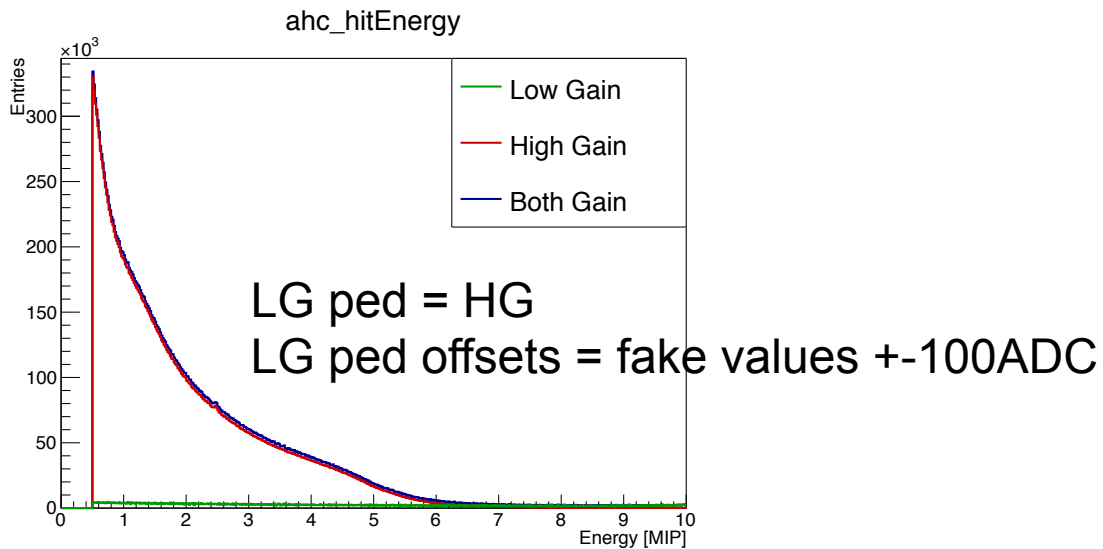
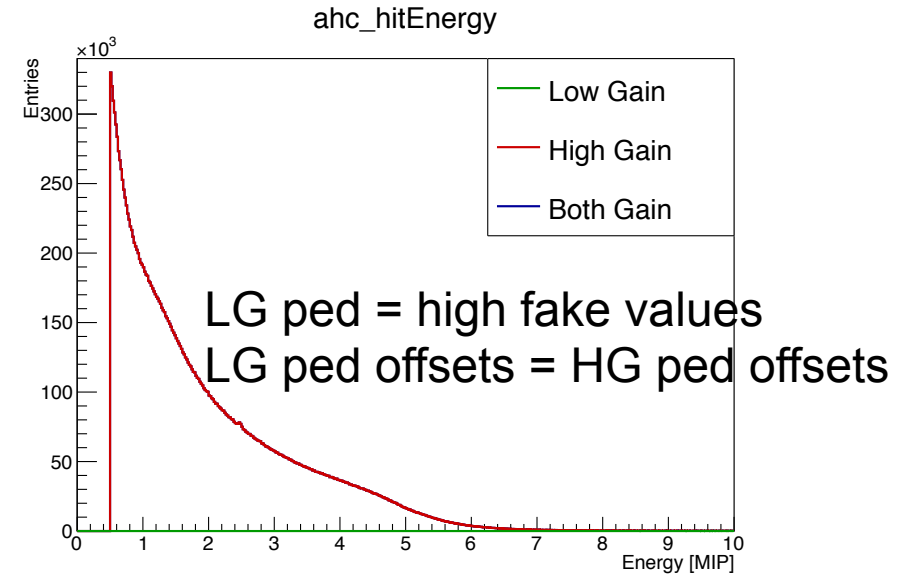
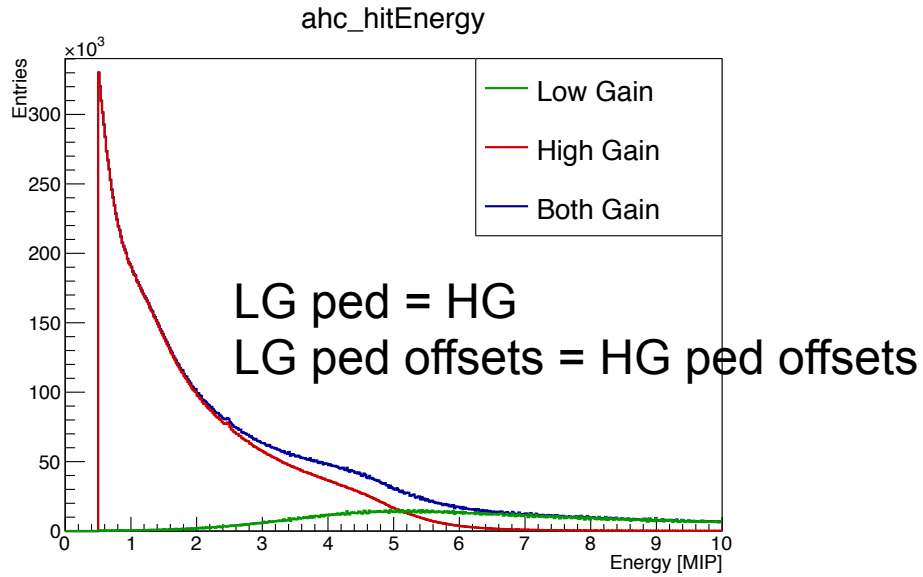
CaliceSoft

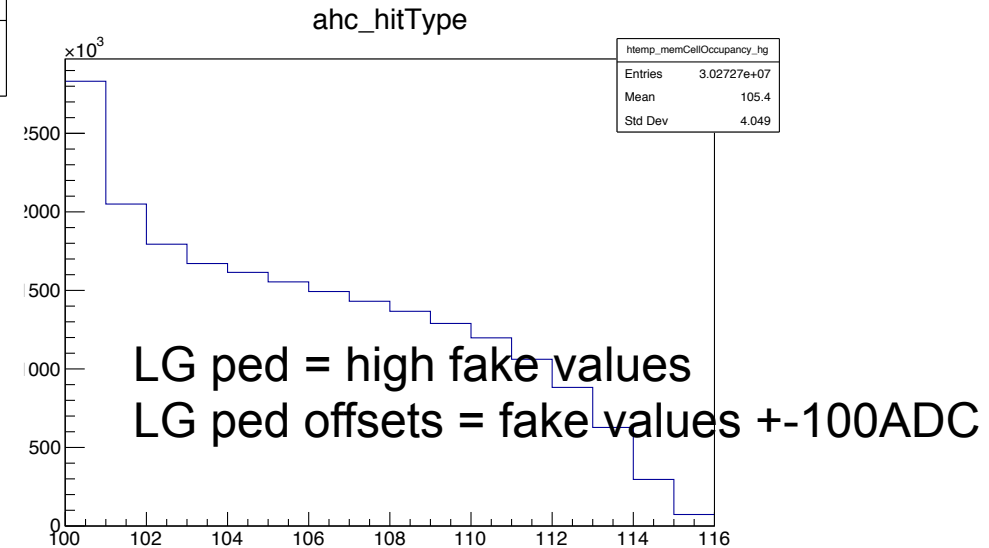
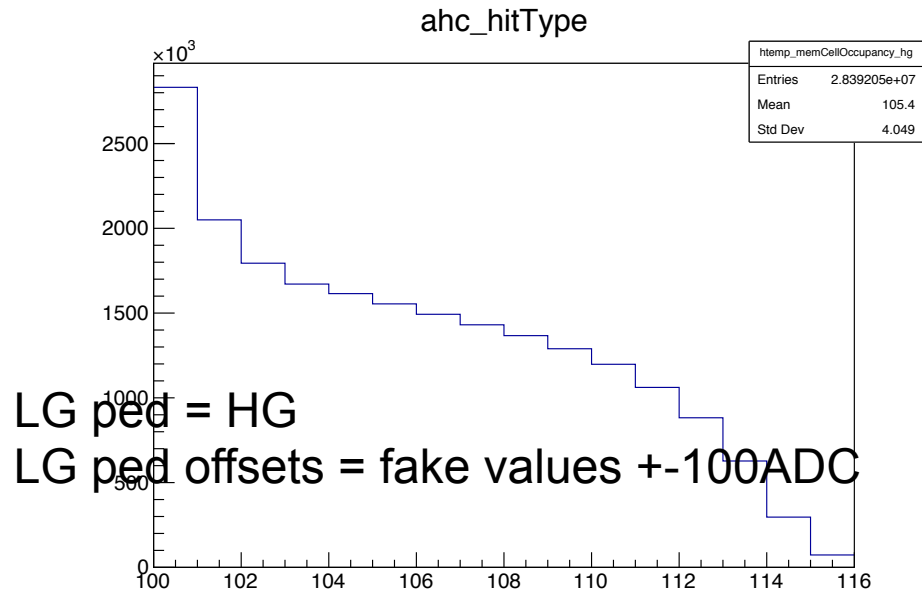
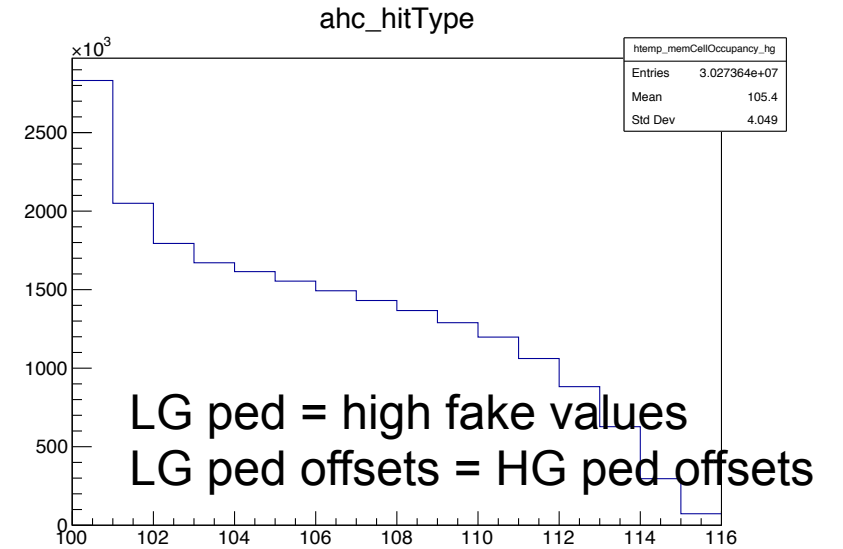
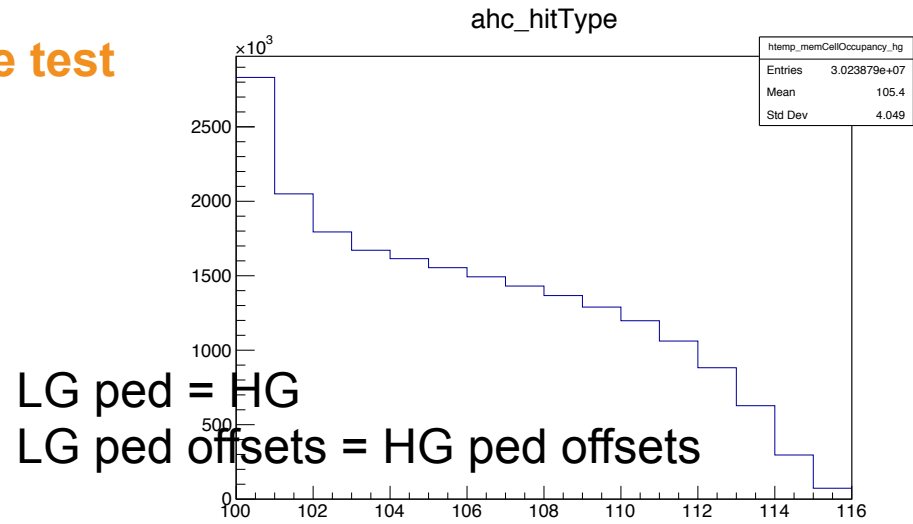
Latest implemented feature to treat HG/LG pedestals individually

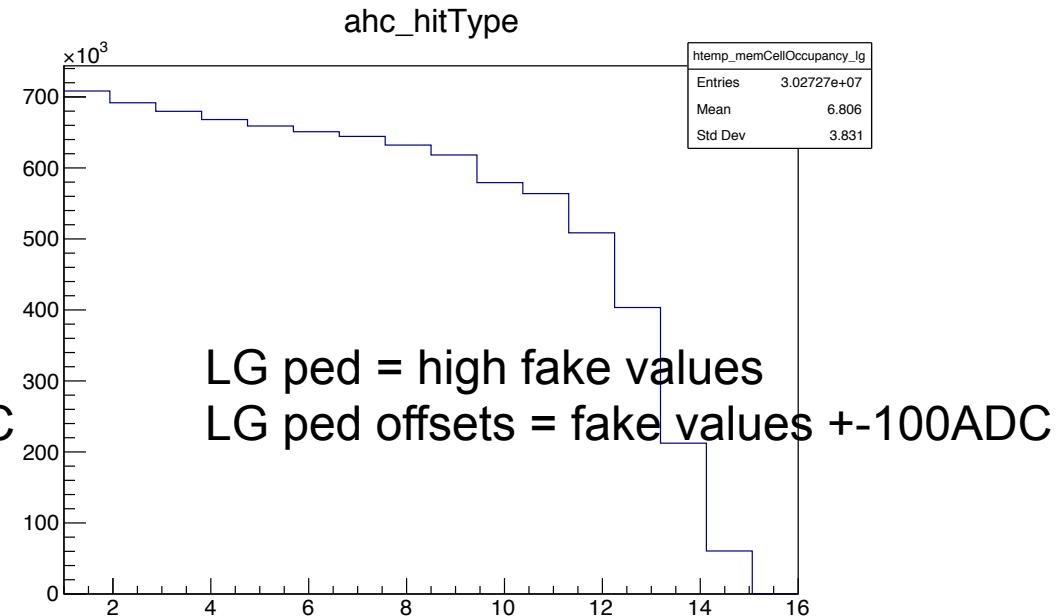
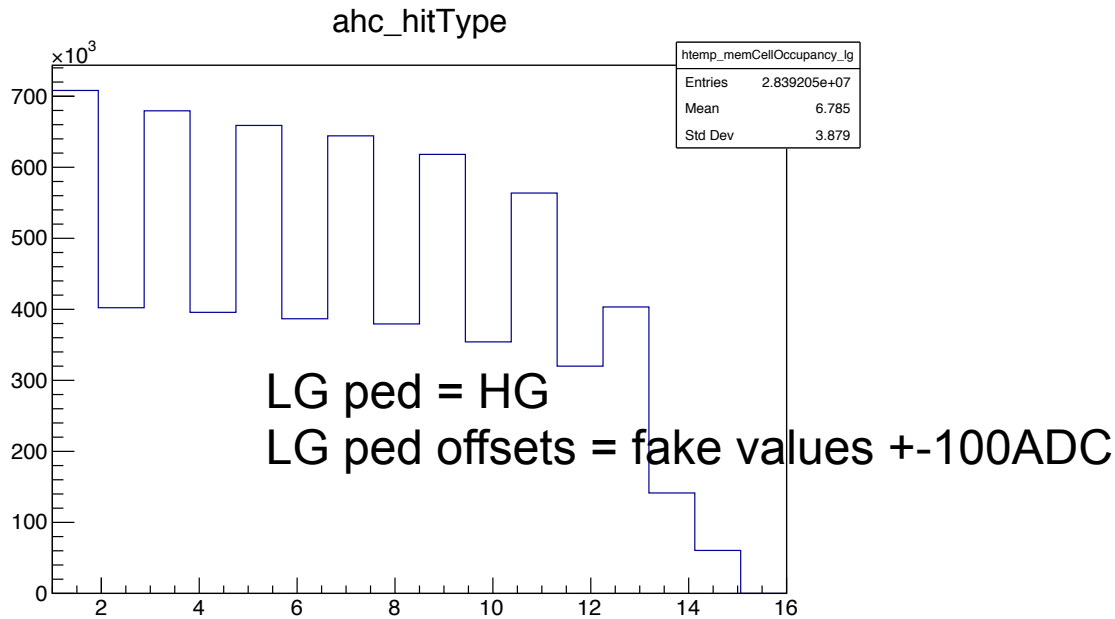
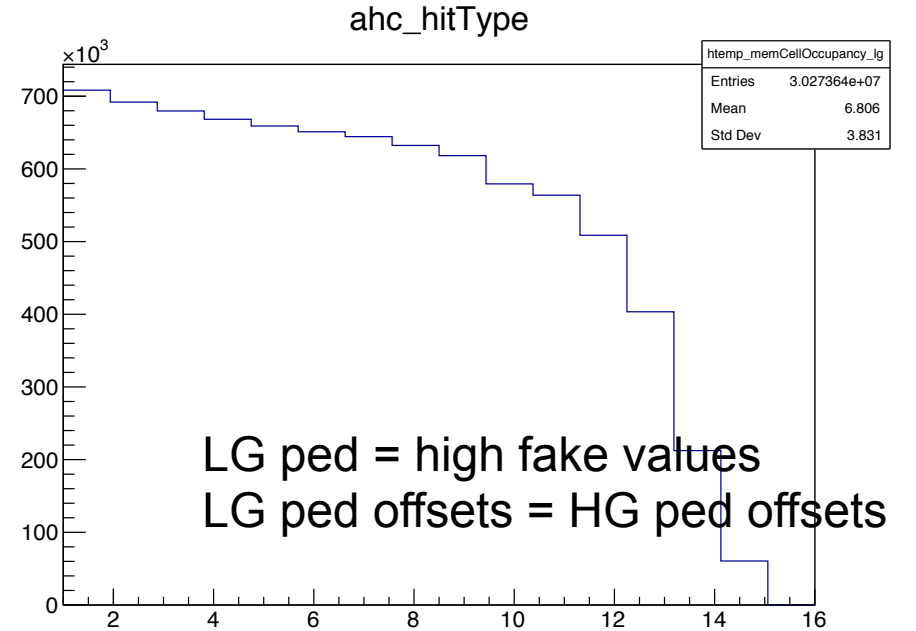
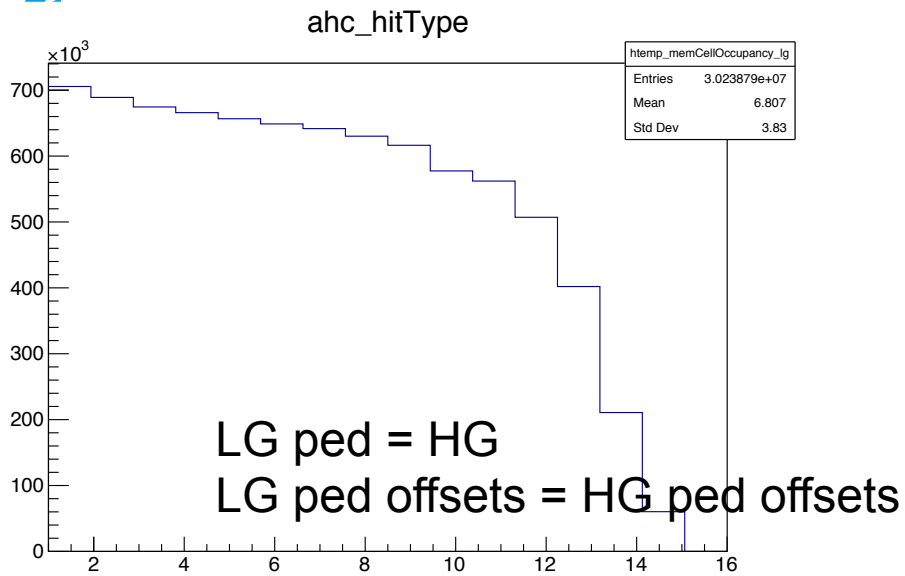
- Feature was implemented to treat HG and LG Pedestals and their corresponding offsets in individual DB collections!
 - ➔ Treat HG/LG hits individually in terms of pedestal subtraction!

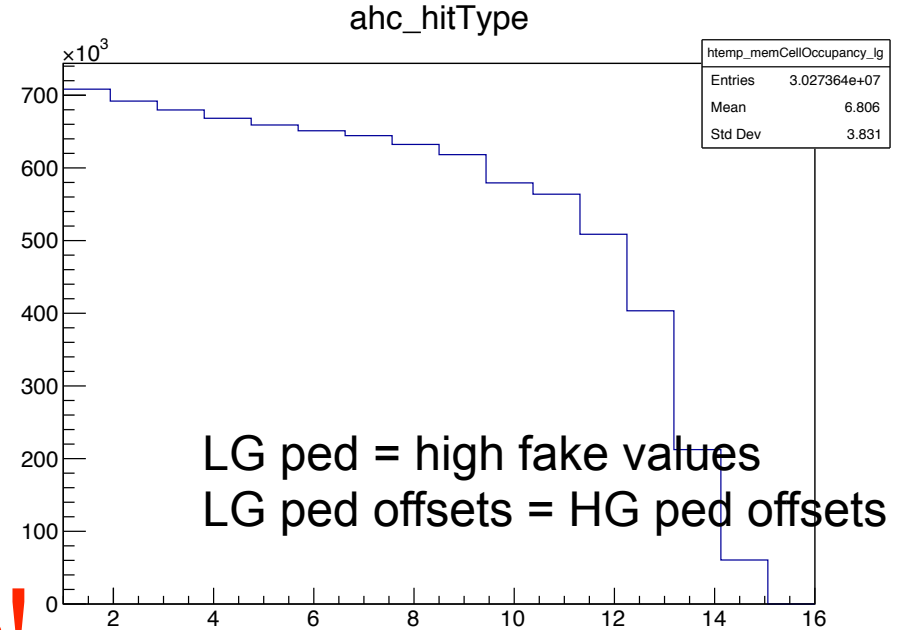
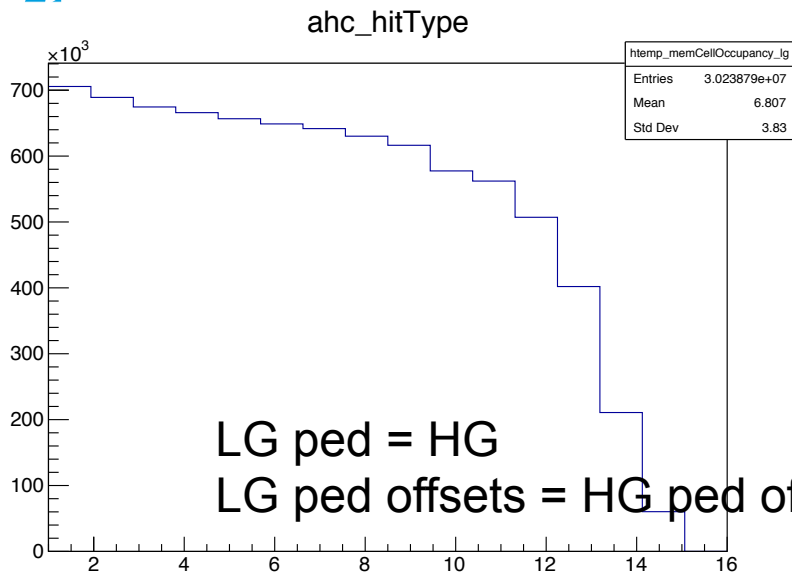
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<!--Name of the memory cell offset pedestal collection-->
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<!--Name of the MIP constants collection-->
```

- Procedure of testing new feature:
 - ➔ Upload fake constants to DB test folder and reconstruct with different combinations of constants:
 - ➔ HG pedestals as LG Pedestals, spectrum the same?
 - ➔ Fake LG Pedestals very wrong values, Fake LG pedestal offset
 - ➔ Check hit energy and cell occupancy in HG and LG individually

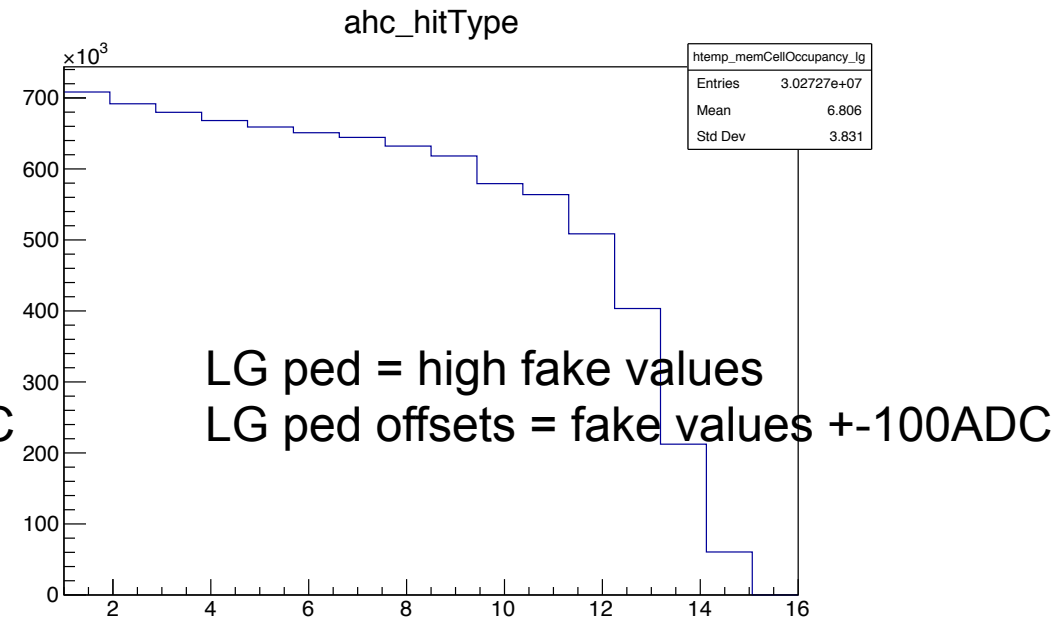
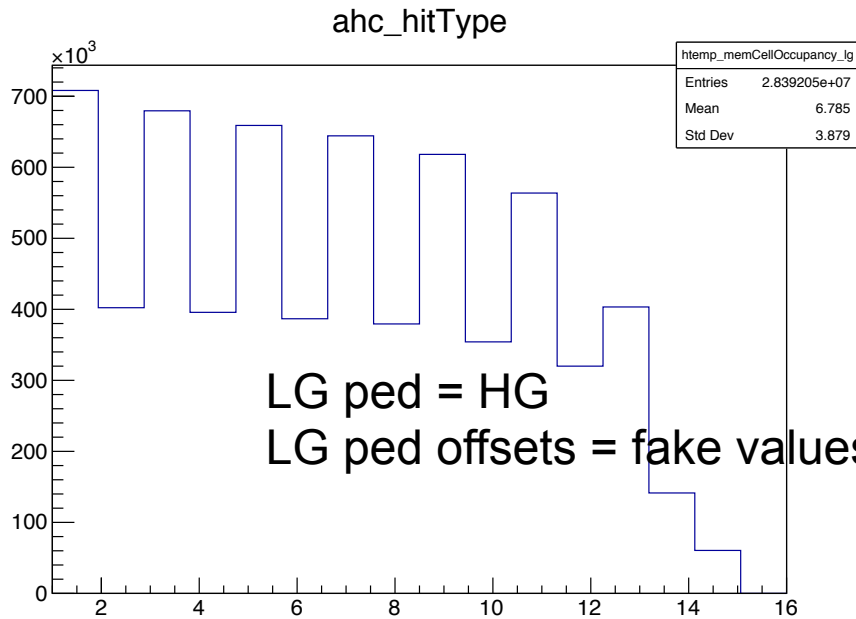








Works!



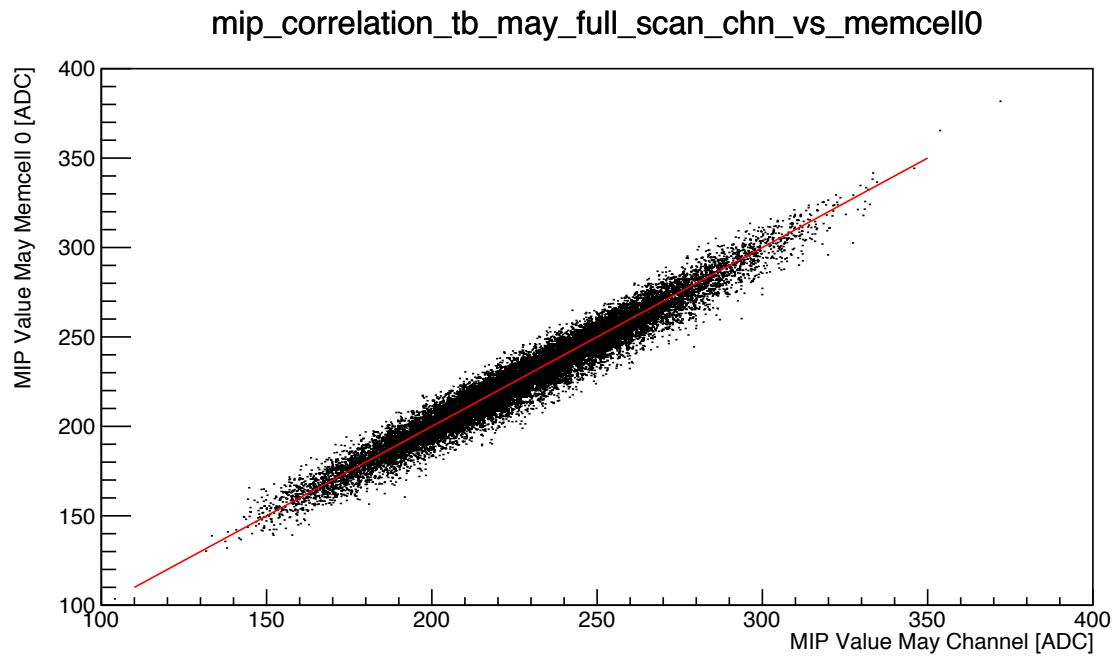
MIP Calibration - Memcell-wise

MIP Spectra - Memcell Check

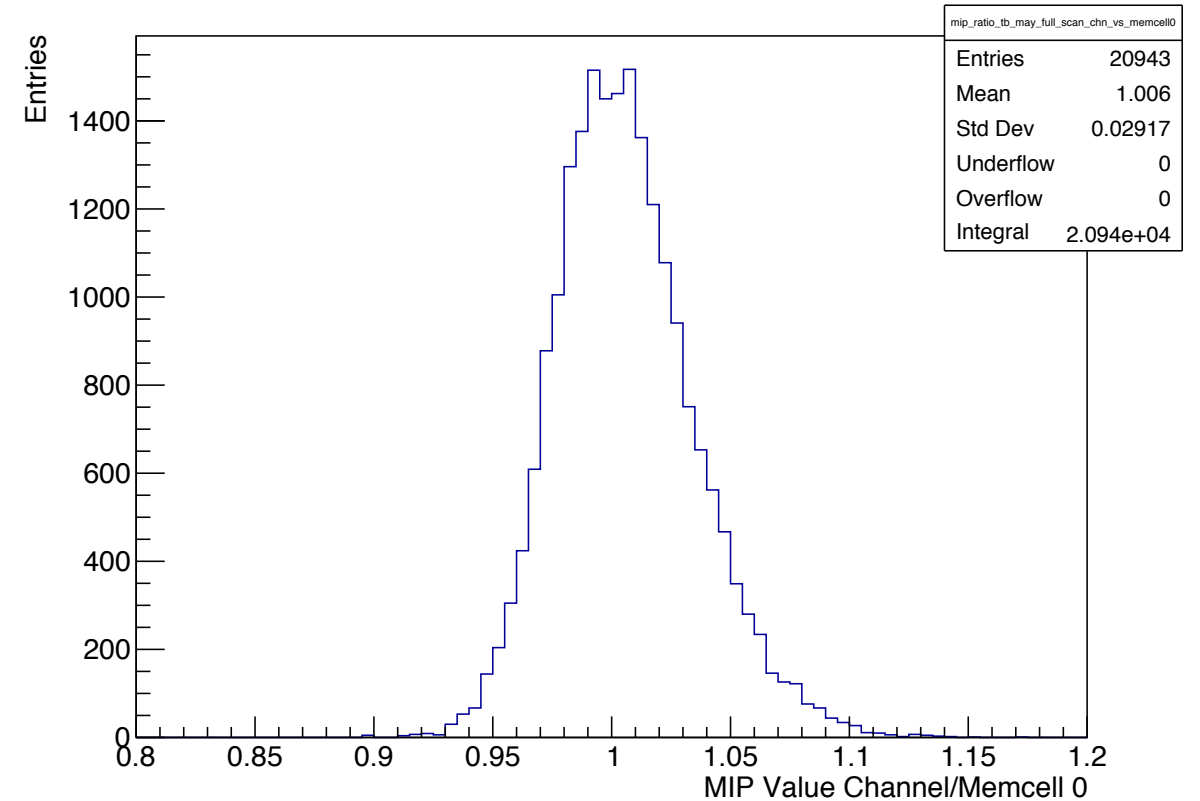
- MIP Calibration code modified so that you can choose individual memory cells to be calibrated only, spectra filled only for a specific memory cell!:
 - ➔ For May full muon scan: Enough statistics to perform MIP calibration for memcell 0, memcell 2 and memecell 5 only for all channels
 - ➔ Compare to channel extracted values!

MIP Calibration - Memcell-wise

MIP Spectra - Memcell Check



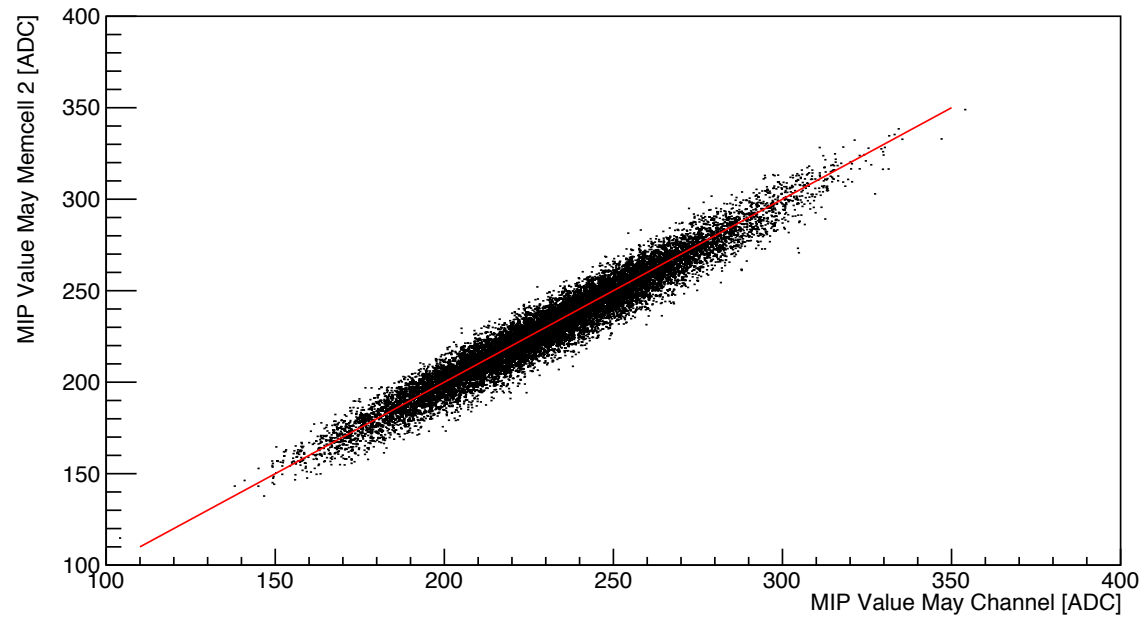
mip_ratio_tb_may_full_scan_chn_vs_memcell0



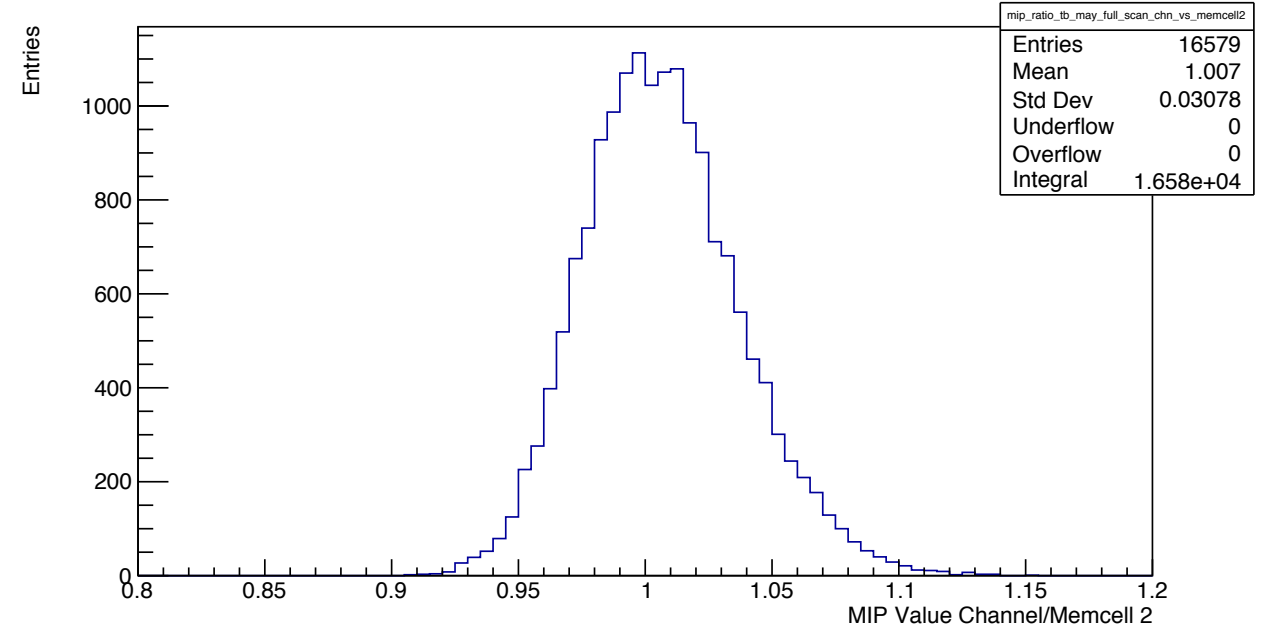
MIP Calibration - Memcell-wise

MIP Spectra - Memcell Check

mip_correlation_tb_may_full_scan_chn_vs_memcell2



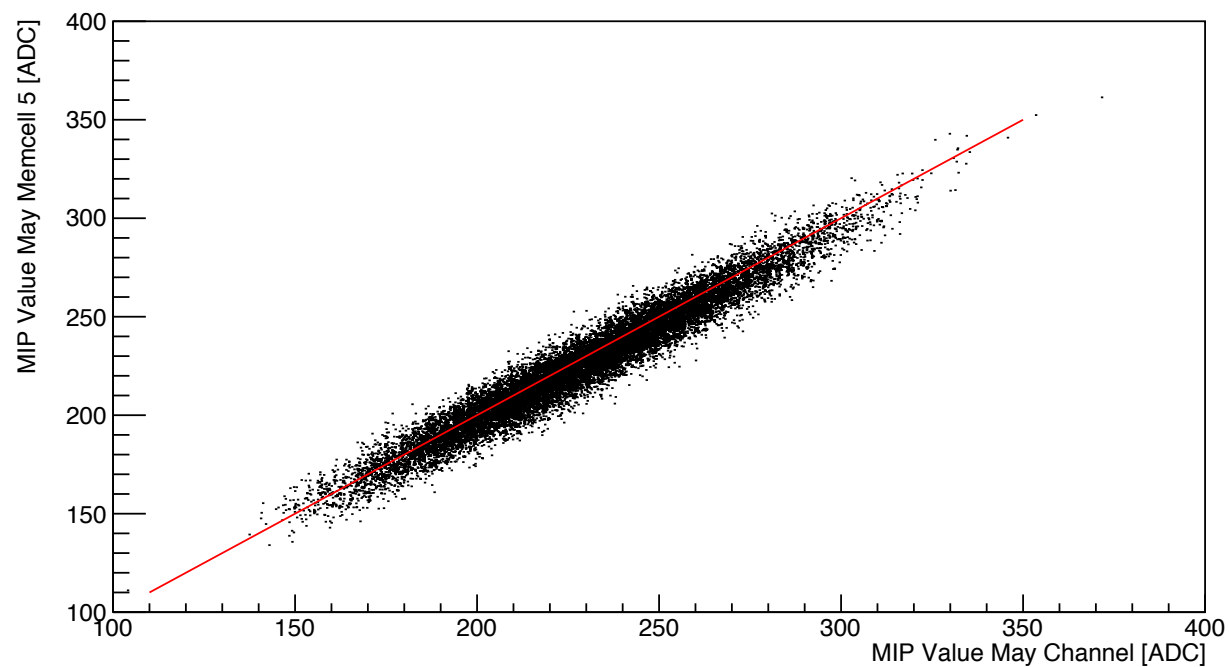
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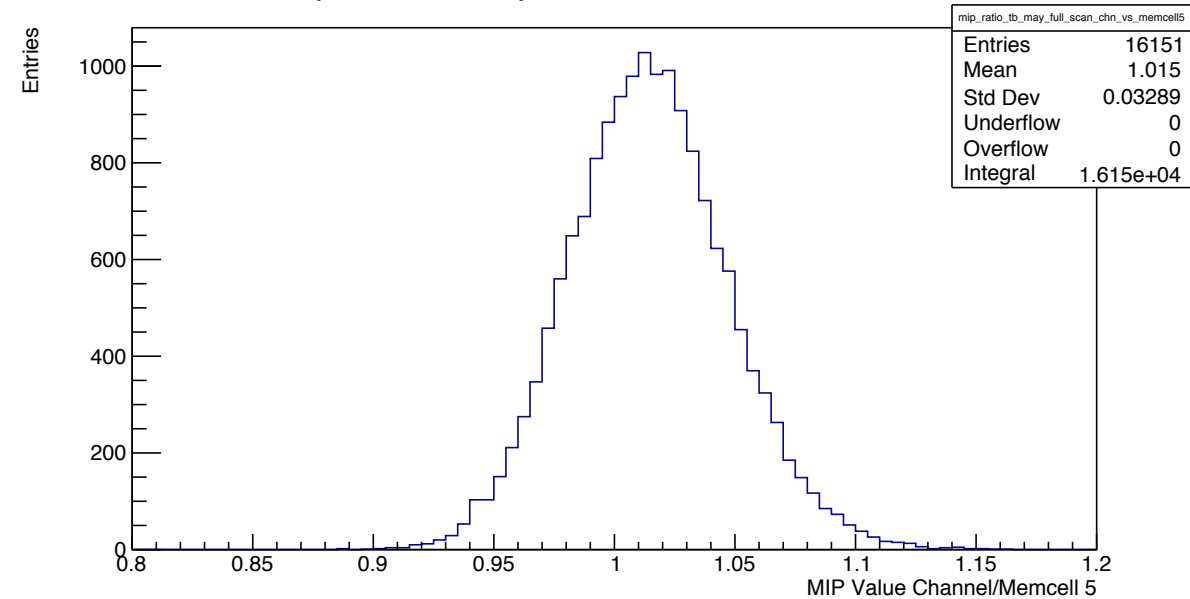
MIP Calibration - Memcell-wise

MIP Spectra - Memcell Check

mip_correlation_tb_may_full_scan_chn_vs_memcell5



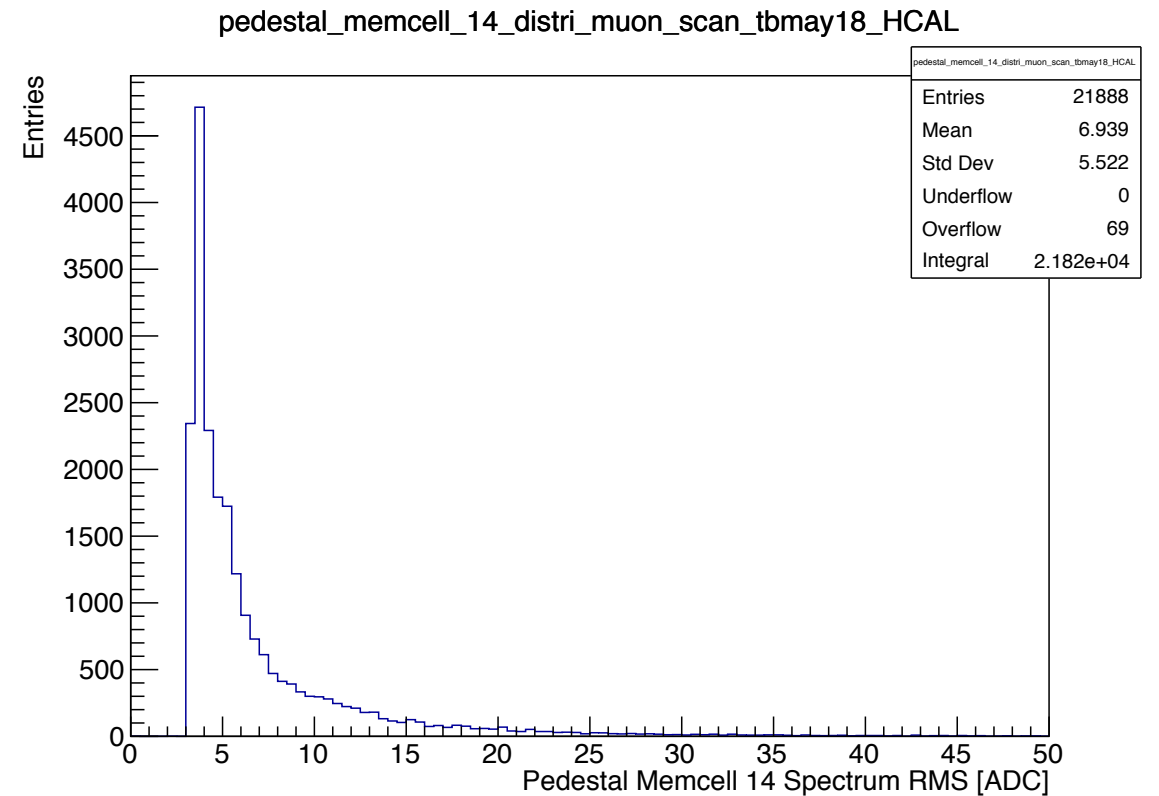
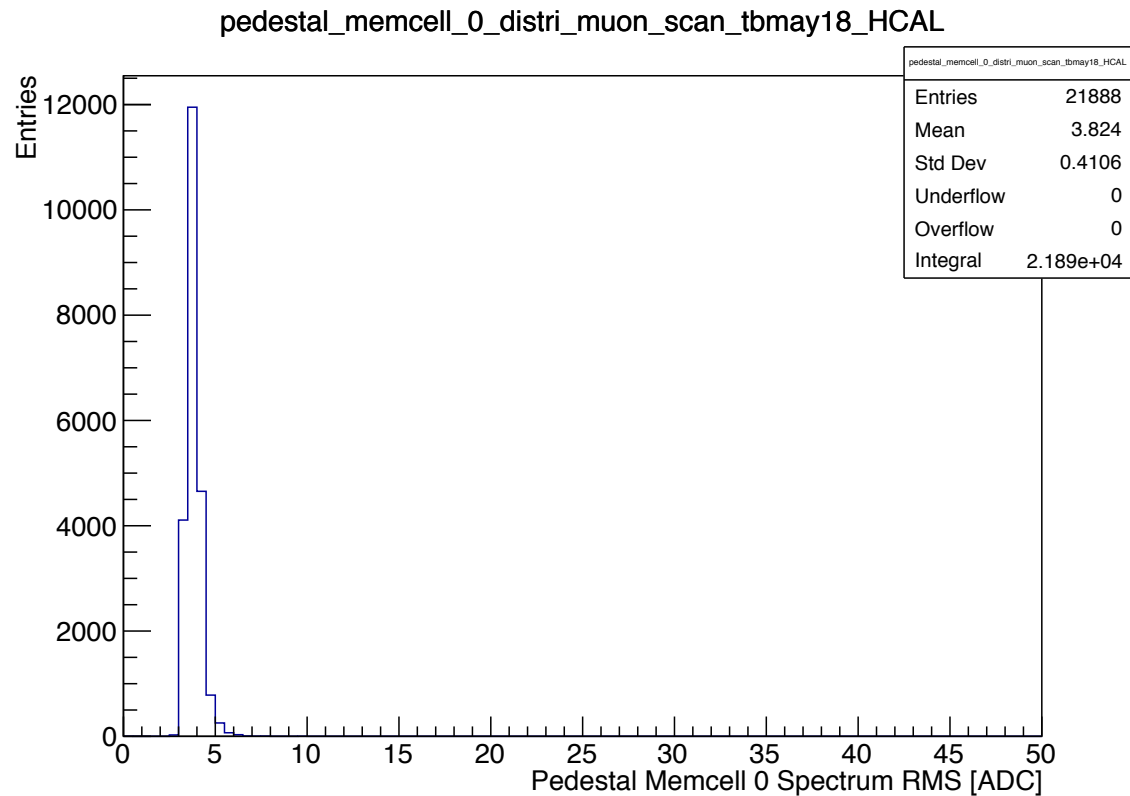
mip_ratio_tb_may_full_scan_chn_vs_memcell5



MIP Calibration - Memcell-wise

MIP Spectra - Memcell Check

- Second question: Do we observe ADC jumps also in physics spectra as for pedestals? Check MIP spectra for specific memory cells!

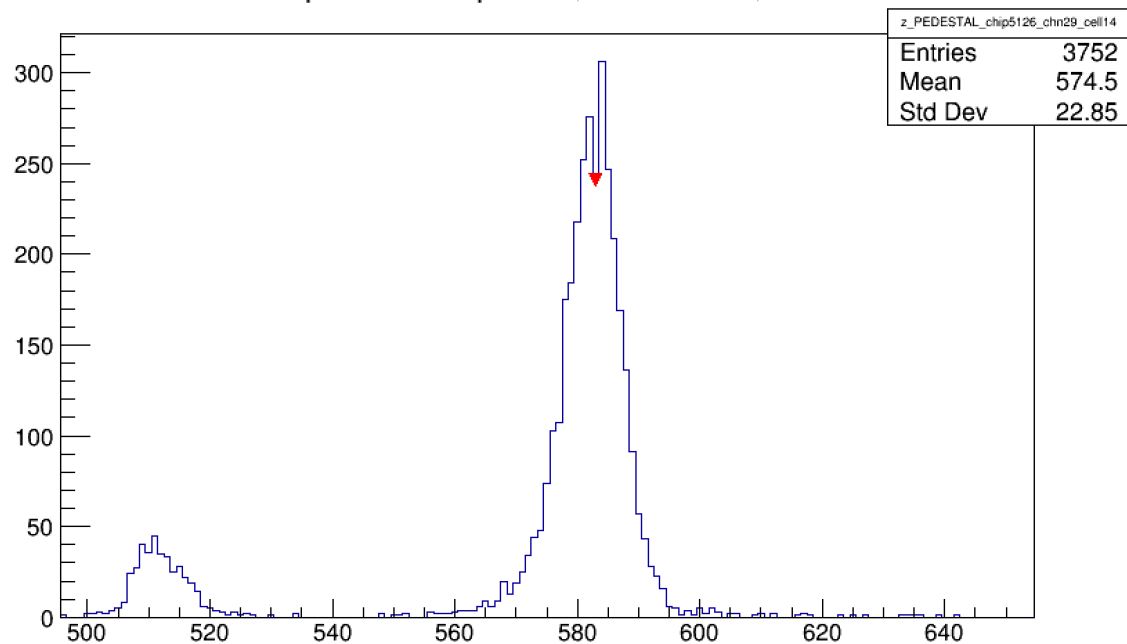


MIP Calibration - Memcell-wise

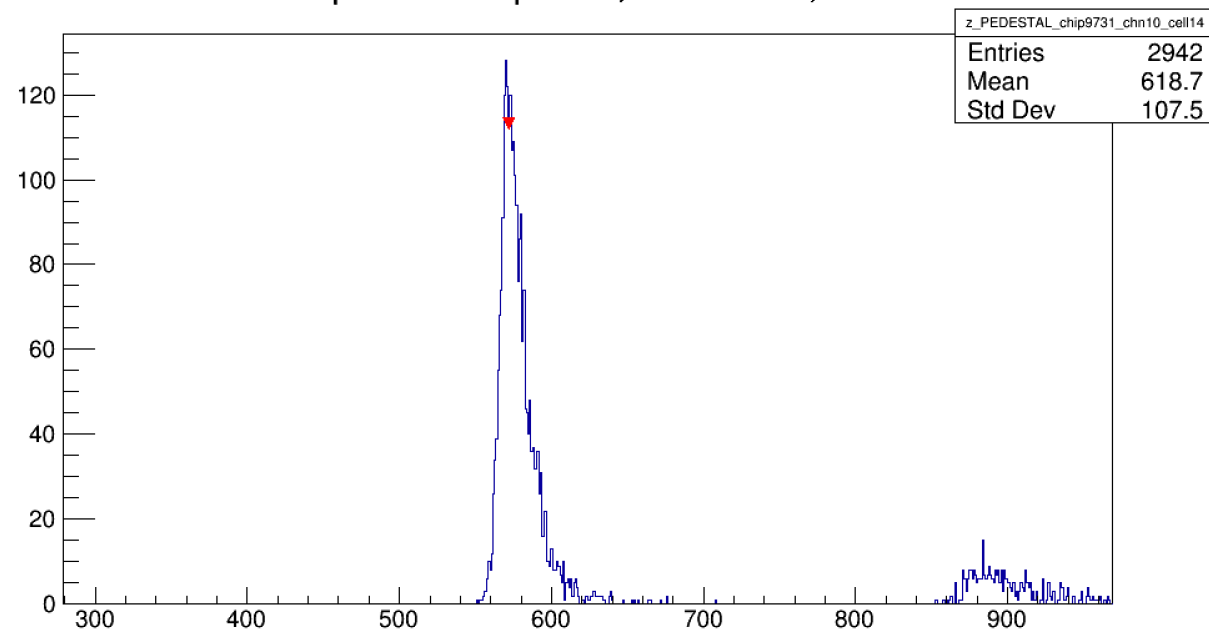
MIP Spectra - Memcell Check

- Second question: Do we observe ADC jumps also in physics spectra as for pedestals? Check MIP spectra for specific memory cells!

Pedestal Spectrum Chip 5126, Channel 29, MemCell 14



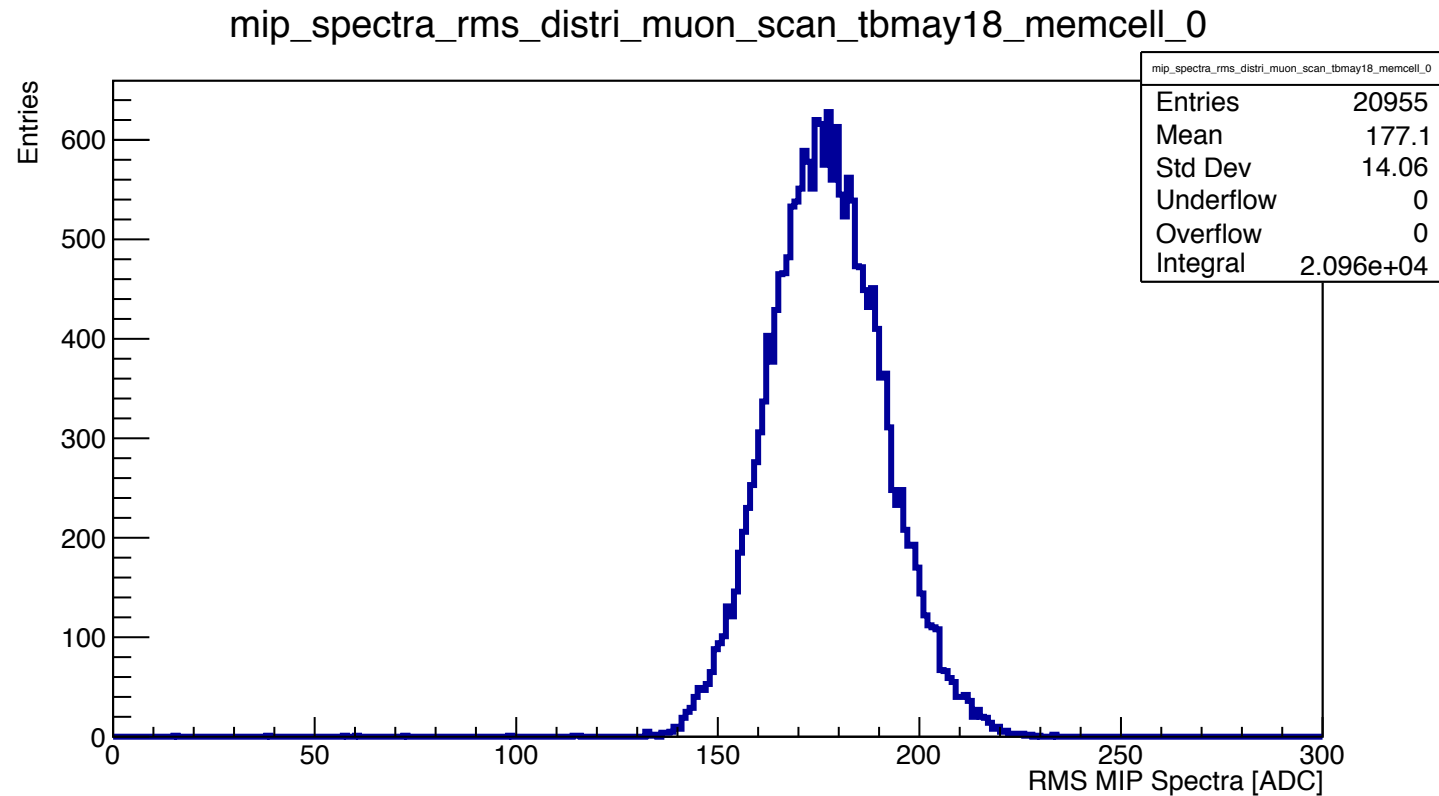
Pedestal Spectrum Chip 9731, Channel 10, MemCell 14



MIP Calibration - Memcell-wise

MIP Spectra - Memcell Check

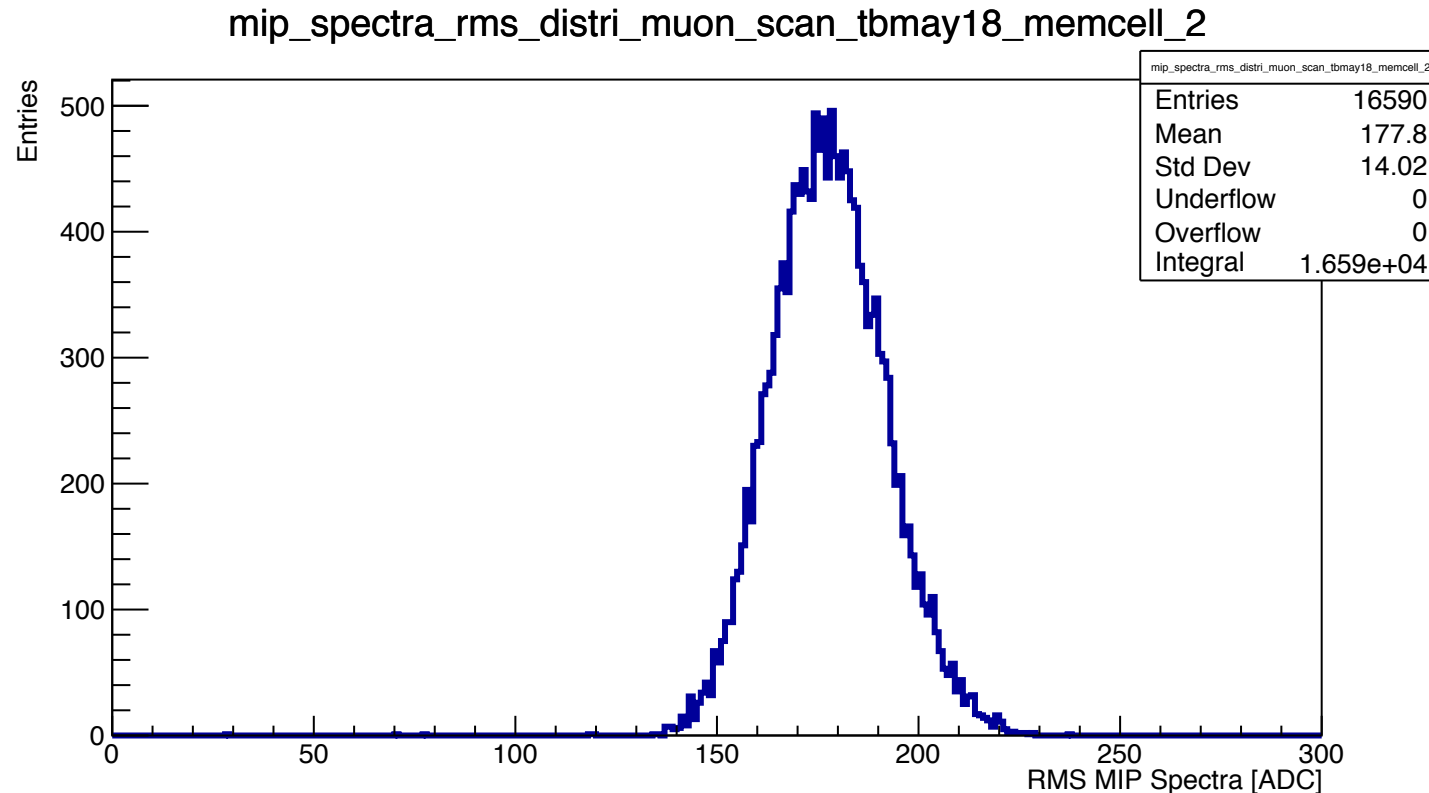
- Extract the RMS of the extracted MIP spectra for a specific memory cell to check for outliers, which would indicate outlier bumps: Fill histo with channels:



MIP Calibration - Memcell-wise

MIP Spectra - Memcell Check

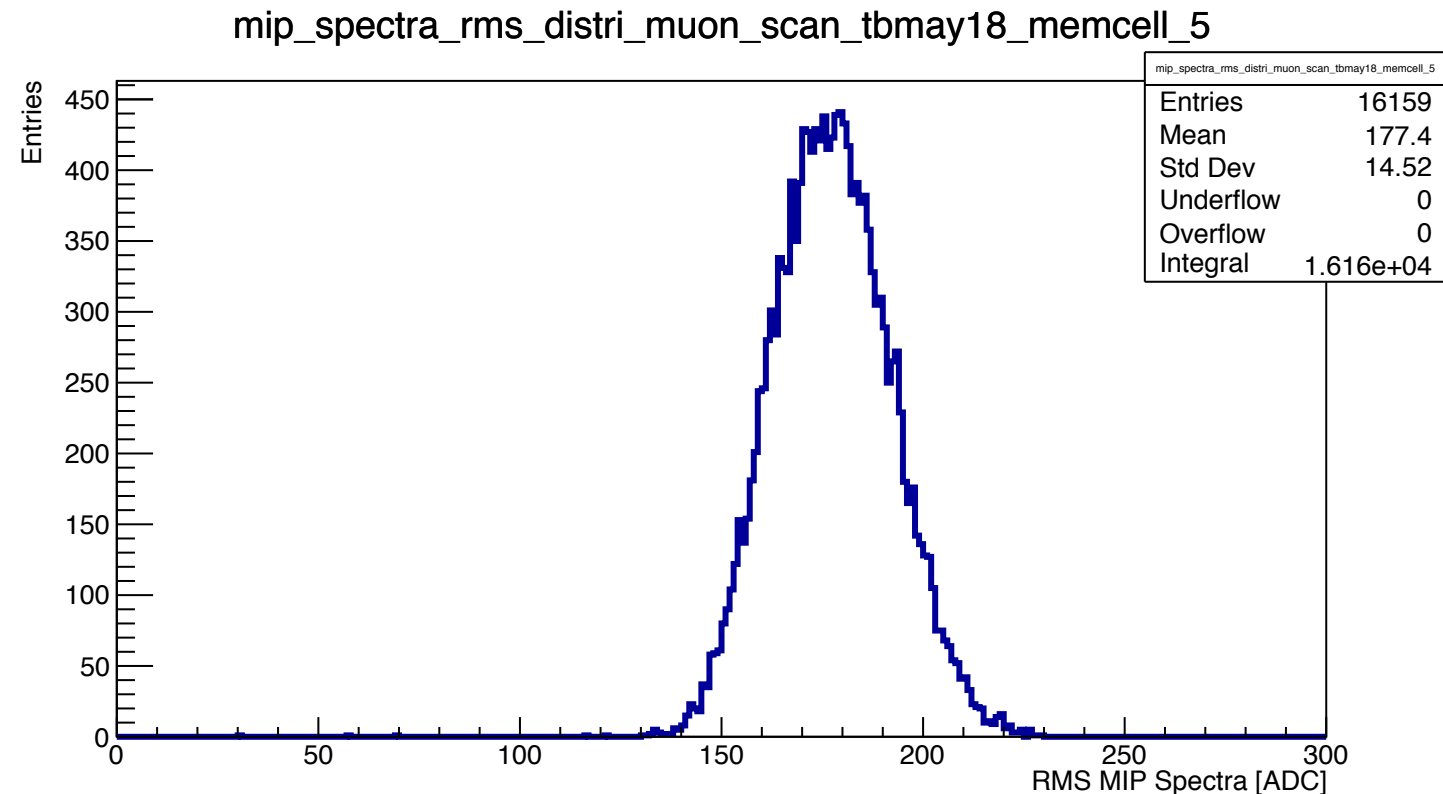
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MIP Calibration - Memcell-wise

MIP Spectra - Memcell Check

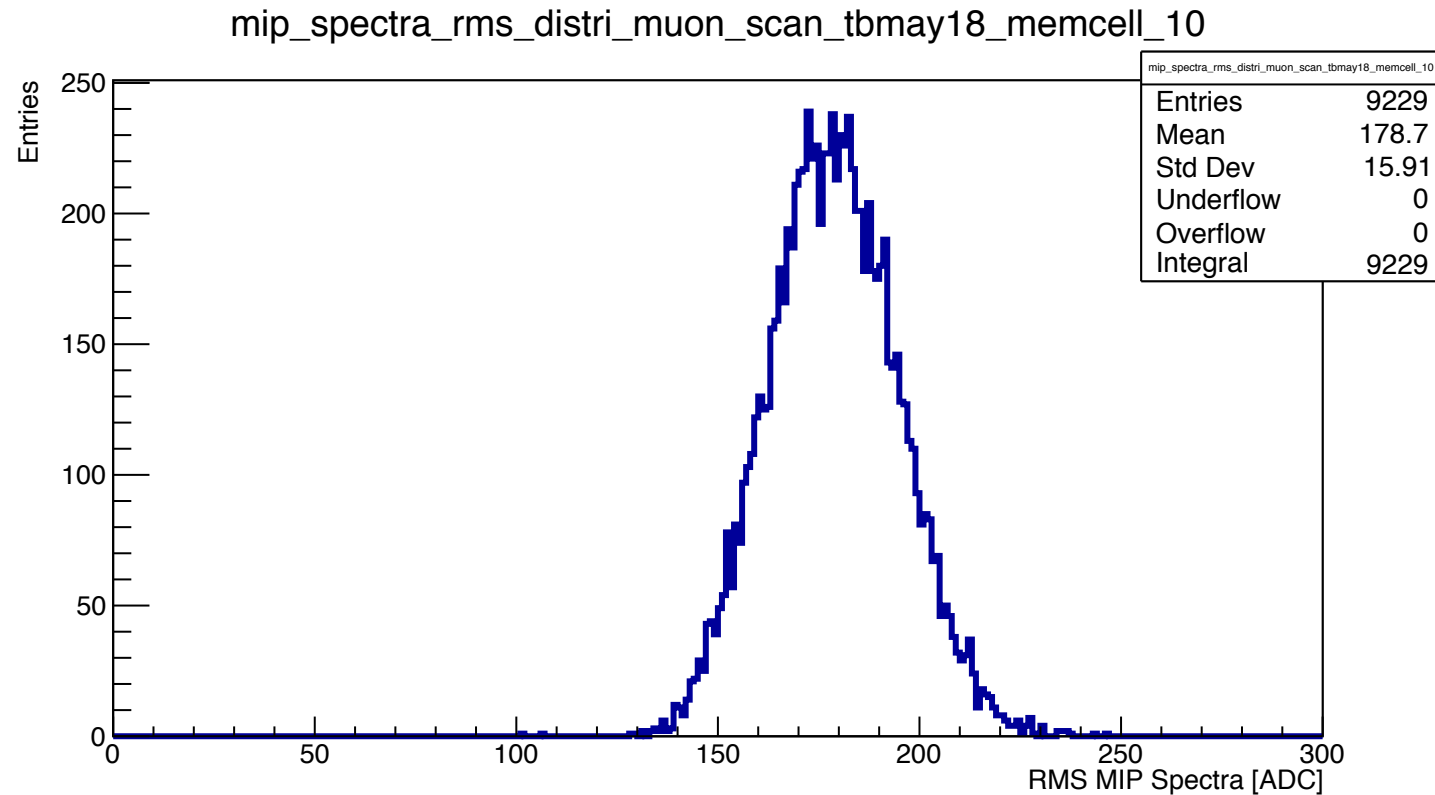
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MIP Calibration - Memcell-wise

MIP Spectra - Memcell Check

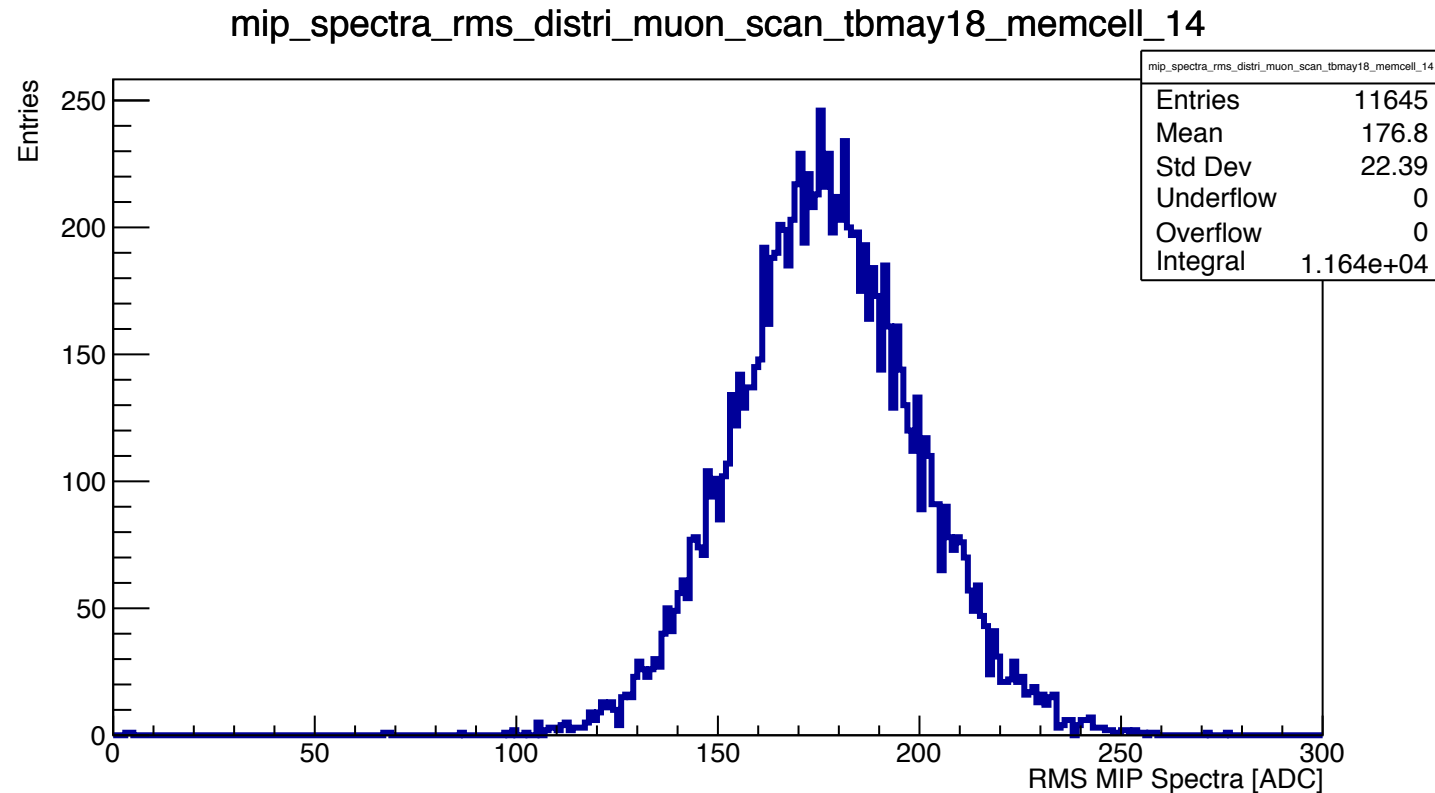
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MIP Calibration - Memcell-wise

MIP Spectra - Memcell Check

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MIP Calibration - Memcell-wise

MIP Spectra - Memcell Check

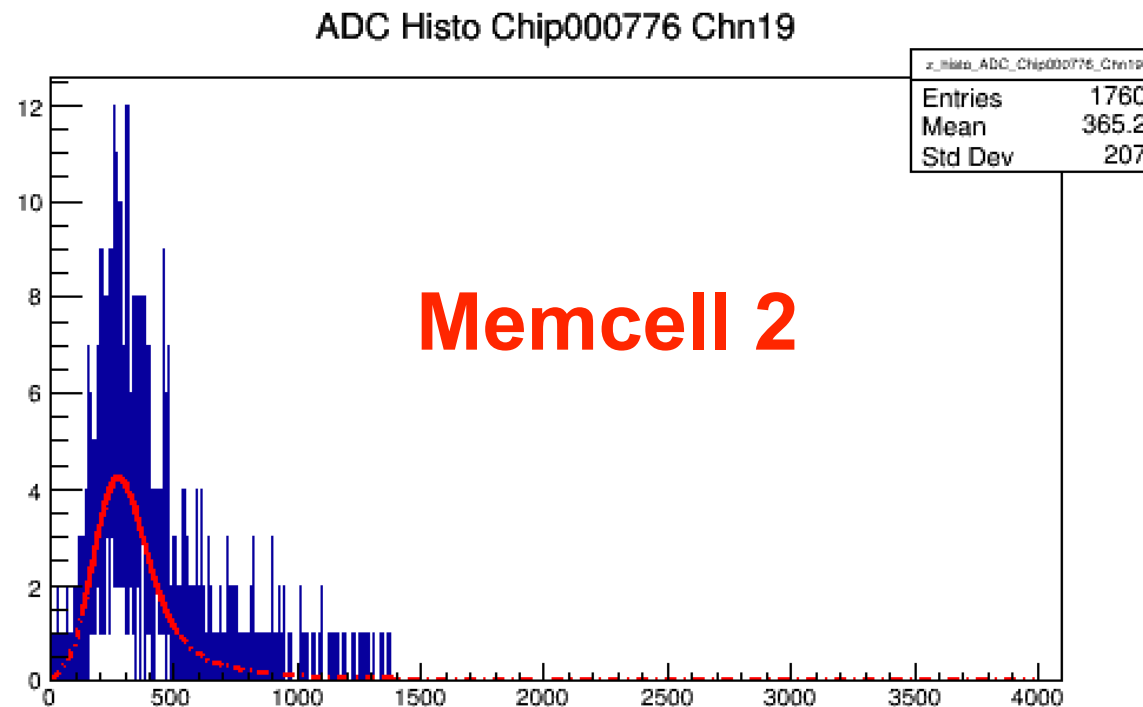
- Extract the RMS of the extracted MIP spectra for a specific memory cell to check for outliers, which would indicate outlier bumps: Fill histo with channels:
- Also cross-checked individual MIP spectra for very problematic pedestal spectra:

26	259	26	14	577.602665983	35.6547938588
27	259	27	14	568.151546392	38.265920111
28	259	28	14	557.671086181	22.4464783633
29	259	29	14	550.476299694	26.0776637245
30	259	30	14	574.491975928	21.7697715806
31	259	32	14	552.938977879	22.3982137303
32	259	33	14	540.930875576	26.8755230074
33	263	19	14	517.957417582	20.2016510024
34	268	3	14	455.40430622	27.1588307318
35	268	4	14	442.394084255	24.4962220514
36	268	8	14	450.252476734	20.9056626978
37	268	14	14	451.358935591	20.0715151955
38	268	22	14	447.194335643	24.1377839974
39	268	26	14	438.733515649	25.7481862561
40	268	30	14	441.665268205	23.5826583621
41	776	19	2	537.150942399	34.4591942433
42	779	22	7	598.643974378	27.1990247168
43	779	22	10	596.803421282	27.2166613841
44	779	22	12	603.546900713	21.7184573917
45	2572	11	14	554.688736682	23.913875361
46	2572	20	14	540.331670823	21.5632116555

MIP Calibration - Memcell-wise

MIP Spectra - Memcell Check

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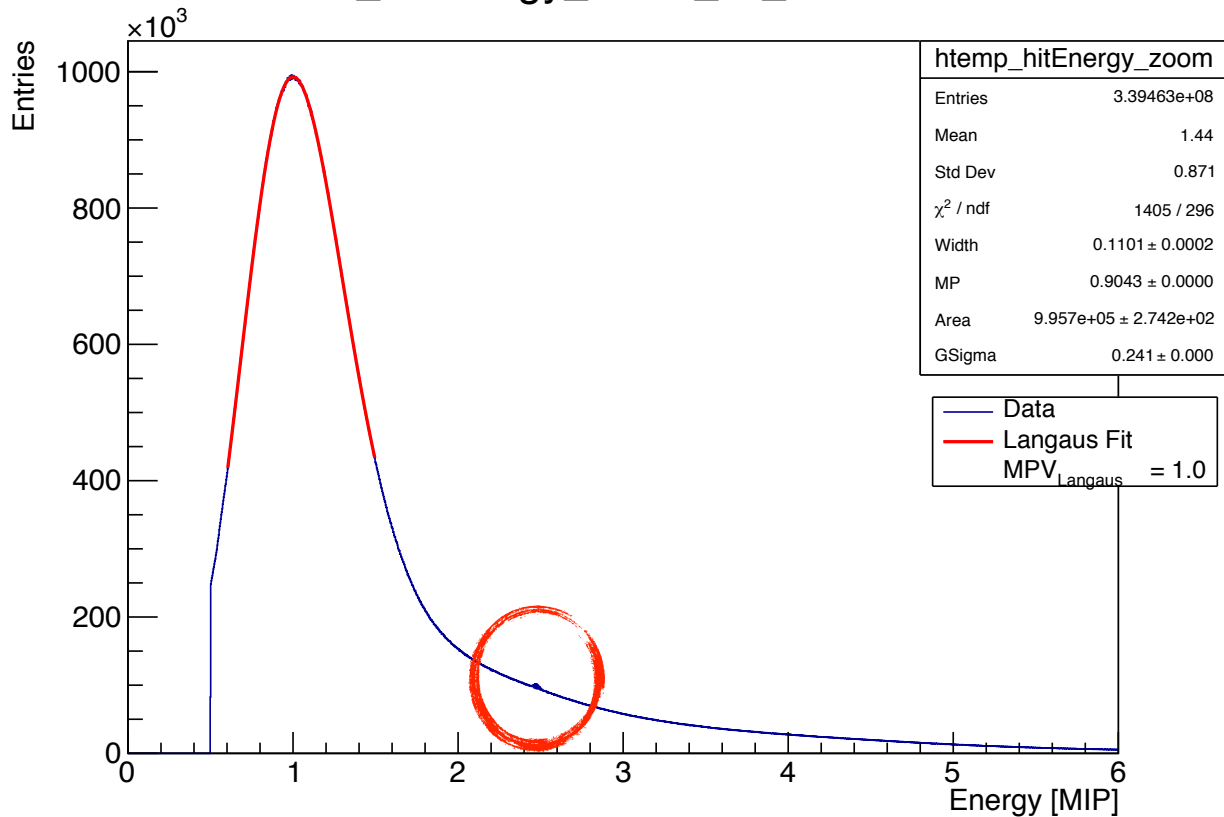


Memory-Cell Pedestal Correction

Observed „feature“

- ➔ Bump appears at 2.5 MIP with latest memory-cell pedestal correction feature in reco of hit energy in global scale for all type of data!

ahc_hitEnergy_zoom_all_channels

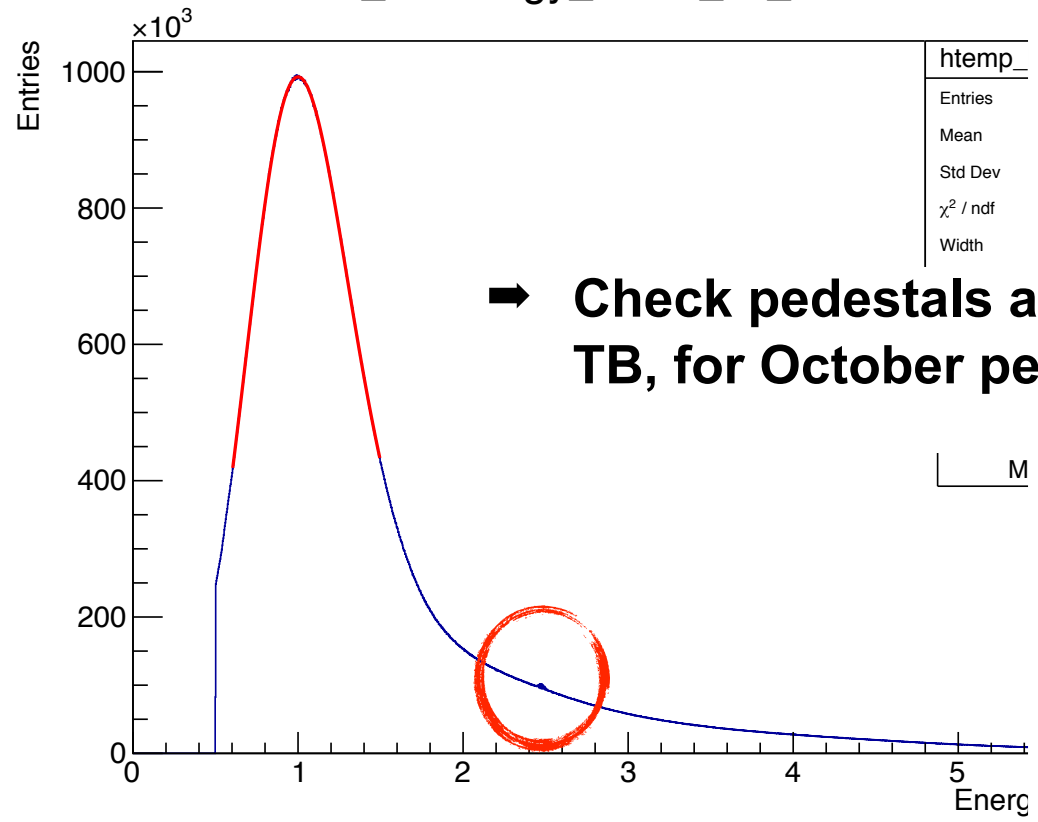


Memory-Cell Pedestal Cor

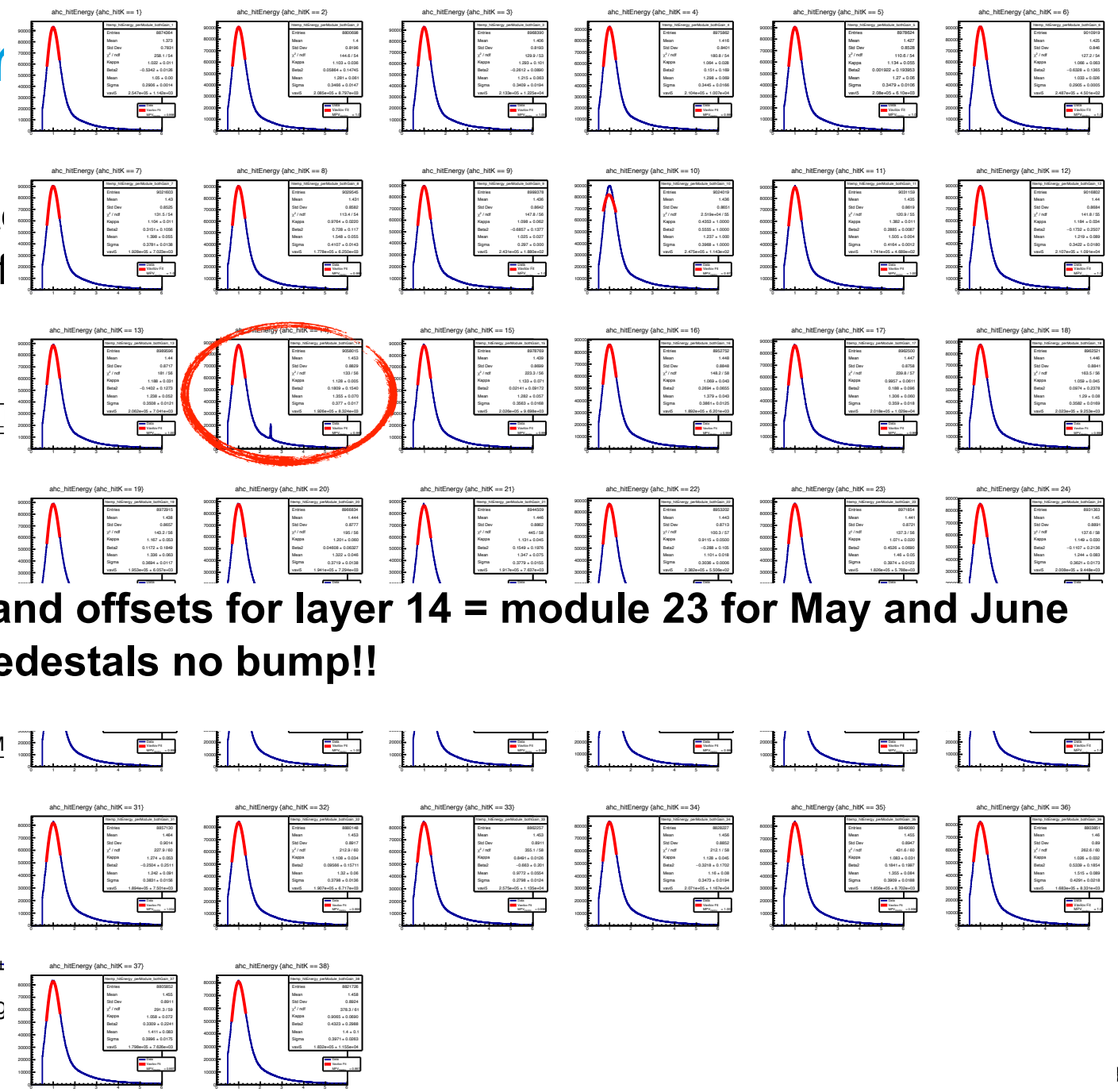
Observed „feature“

➔ Bump appears at 2.5 MIP with late reco of hit energy in global scale 1




ahc_hitEnergy_zoom_all_channels



➔ Check pedestals and offsets for layer 14 = module 23 for May and June TB, for October pedestals no bump!!



Summary and ToDo's

- HG/LG Pedestal + HG/LG Pedestal Memory Cell Offsets Software feature implemented and tested for all possible configurations 
 - ➔ Working, ready to test new LG pedestals + offsets from Yuji
 - ➔ Can be implemented in next CaliceSoft release
- MIP Calibration software modified to extract MIP Spectra memory cell-wise: 
 - ➔ Correlation for channel to cell 0, cell2 and cell5 MIP constants very good, higher cells lack of statistics
 - ➔ **Good news: No observed jumps in MIP memory cell spectra as for pedestal!** 
 - ➔ Checked individual spectra with highest jumps in pedestal spectra
 - ➔ Checked RMS of MIP Spectra for indication of „second“ bump **Last checks**
- Check bump in module 15 for memcell offset correction feature **Next**
- Together with Linghui: Intro for SSF from Vlad, modification for latest prototype, first studies.. **Next**